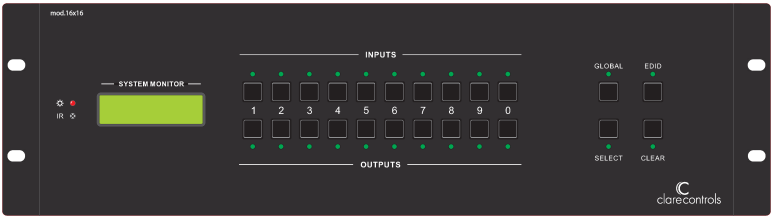
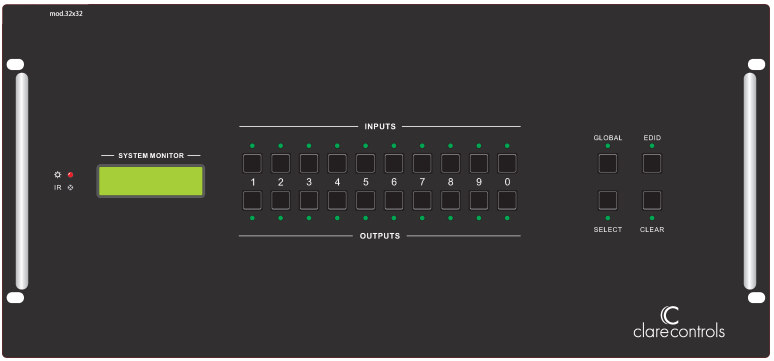
Modular Matrix Switch User Guide

Models HDBaseT 16x16 and 32x32





2014-11-753 • Rev 01

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Manufacturer Clare Controls, Inc.
7519 Pennsylvania Ave., Suite 104
Sarasota, FL 34243, USA

Version This document applies to HDBaseT 16x16 and 32x32 Matrix Switches Models CM-MM161610-HD and CM-MM323210-HD Rev 01.

Contact information For contact information, see www.clarecontrols.com.

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Important information

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Introduction

About the switch system

The HDBaseT 16x16 and 32x32 matrix switches are high-performance video and audio modular matrix switches. Various changeable cards make matrix switches flexible and an all-in-one solution for different projects. The matrix switches can support different video signals with cross switching. Every video or audio signal is transmitted and switched independently; this will cause the least signal attenuation, so that the output signal keeps its high fidelity.

Two series of changeable cards work with matrix switches, input card MOD-4I series and output card MOD-4O series. All the cards support hot plug-and-play. Users can choose the right card for different applications. Different signal cards are used for processing different video signal, including HMDI, VGA, and HDBaseT.

The matrix switches can be used for different projects, because of the changeable card design. It is the combination solution for multimedia conference rooms, control rooms, broadcasting rooms, and shopping centers. The matrix switches can handle all the audio and visual management, including the switching, driving, and scaling.

Features

- Modular chassis with configurable I/O slots, ranging from 16x16 to 32x32
- Various I/O cards, includes HDMI, VGA, and HDBaseT cards (compatible with YUV, YC and CVBC) to configure any matrix
- True cross-point switching for any input to any output, regardless signal format
- Advanced EDID management, three ways to guarantee maximum compatibility
- Supports HDMI 1.4a and 3D
- Integrated HDBaseT technology
- I/O cards works directly with CATx or a fiber optic extender
- Ultra-switching for an instantaneous display, ensuring the transition runs smoothly
- Unique pixel-accurate and re-clocking technology provides exceptional output transmission and accurate timing
- Controlled via buttons, RS-232, TCP/IP, IR, also compatible with third-party controls
- Field-upgradeable and hot-swappable, friendly to use and maintain
- HDCP compliant
- LCD display

Package contents

- 1 x modular matrix switch (with empty slots and empty covers)
- 1 x RS-232 cable
- 1 x IR remote (battery is not included)
- 2 x power cord
- 4 x plastic cushions
- 1 x user manual

Switcher models

Table 1: Title of the table

Model	Height	Maximum slot	Power supplies	RS-232 control	Network control
16x16	3U	4 input card slots and 4 output card slots	Dual	√	Optional
32x32	5U	8 input card slots and 8 output card slots	Dual	√	Optional

Signal cards

To meet different situation and users, the signal cards are classified into the following models.

Input cards

Table 2: Input cards

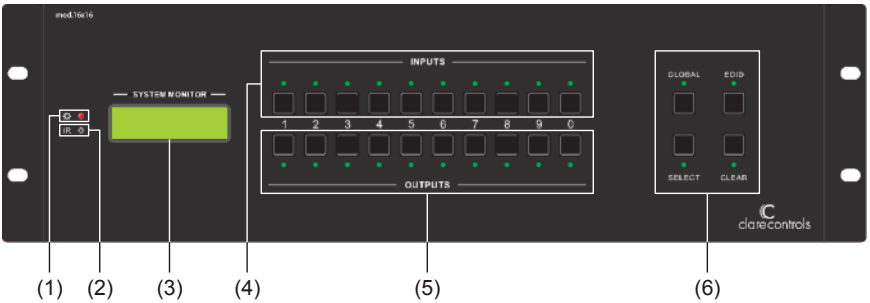
Models	Inputs	Signal Format
CM-MOD-HDI10	4	HDMI
CM-MOD-VGI10	4	VGA
CM-MOD-HDBI10	4	HDBaseT

Table 3: Output cards

Models	Outputs	Signal Format
CM-MOD-HDO10	4	HDMI
CM-MOD-VGO10	4	VGA
CM-MOD-HDBO10	4	HDBaseT

Front panel

The 16x16 and 32x32 switches share the same function buttons, but only differ in case height.



(1)	Power indicator	Power 'on' indicator light.
(2)	IR receiver	IR receive window.
(3)	LCD indicator	Shows real-time system status.
(4)	INPUTS	Allows direct selection of the input channel from 1 to 16 or 1 to 32.
(5)	OUTPUTS	Allows direct selection of the output channel from 1 to 16 or 1 to 32.
(6)	FUNCTION	**GLOBAL**: Used to transfer video and audio signal (HDMI) of an input channel to all output channels. **Example**: To transfer HDMI signal from input channel 7 to all output channels, press the buttons as follows: Input “0” “7” + “GLOBAL” + “Select”.
		EDID: Used to manually control EDID management. **Example**: To learn the EDID data of the display on output channel 2 to input channel 3, press the buttons as follows: "EDID" + Input "0" "3" + Output "0" "2".

	SELECT: Used to transfer video and audio signal (HDMI) from an input to an output. **Example** To transfer both the video and audio signals from input channel 3 to output channel 4, press the buttons as follows: Input “0” "3" + Output “0” "4" + "SELECT".
	CLEAR: Clear an operation, such as switching output channel, studying EDID data before it comes into effect. Meanwhile, the switcher returns to the previous state.

Front panel button control

Users can control the switch rapidly and directly using its front panel buttons. The following is a brief operation guide to operating the front panel buttons.

Switching I/O connection

Function: Switch I/O connection. It is important to know that input and output channels should be double-digit. For example, input 01 represents input 1.

Format: **Input Channel + Output Channel + Select**

Examples

- To transfer input 1 to output 11, press the following.

  (input) **0 1** + (output) **1 2** + **Select**.

- To transfer signals from input 1 to all output channels, press the following.

  0 1 + Global + Select.

EDID Management

Function: Enable the input channel to capture and learn the EDID data of an output.

Format: **EDID + Input Channel + Output Channel + Select**

Example

- To enable input 1 to learn the EDID data of output 2, press the following.

  EDID + (input) **0 1 +** (output) **0 2 + Select**.

Clear the previous operation

Function: Clears the previous operations before pressing **Select** to enforce it. Pressing **Clear** only erases the operations not confirmed by pressing **Select**.

Notes

- **Input Channel**: Fill with the number of input channel to be controlled,
- **Output Channel**: Fill with the number of output channels to be controlled. Press Global to select all the outputs.
- The input and output channels on the rear panel are counting from left to right, and top to bottom.
- The input delay time between two numbers of every input and output channel must be less than 5 seconds; otherwise, the operation will be cancelled.
- End every operation by pressing Select to confirm the operation.

External connections

Input and output connectors

The 16x16 switch has 8 card slots (max.) in the rear panel, including 4 input slots and 4 output slots.

The 32x32 switch has 16 card slots (max.) in the rear panel, including 8 input slots and 8 output slots.

Note: The cards in the pictures are for reference, only. You can choose different cards in different cases, each supporting plug-and-play.

Changeable cards introduction and installation

You can insert changeable cards into empty slots on the matrix switches (hot-swap) and include different signals, such as HDMI, VGA, and HDBaseT. The following introduces you to each card.

HDMI cards

See Table 10: HDMI (CM-MOD-HDI10 and CM-MOD-HDO10) on page 18.

The HDMI signal card is embedded with EDID management technology and supports CEC and DDC.

CM-MOD-HDI10: This input card supports four input signals (max.). Input signals can pass to output devices through the MMX-4O-HD, or other types of output cards.

CM-MOD-HDO10: This output card supports four output signals (max.). Output signals can come from MMX-4I-HD, or other types of input cards.

The following figure shows the pin layout for the HDMI connectors (female).

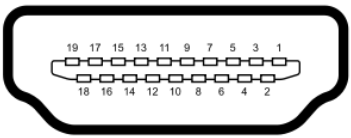


Table 4: HDMI connector pin layout

Pin	Signal Name	Pin	Signal Name
1	TMDS Data 2+	20	SHELL
2	TMDS Data 2 Shield	19	Hot Plug Detect
3	TMDS Data 2-	18	+5V Power
4	TMDS Data 1+	17	Ground
5	TMDS Data 1 Shield	16	DDC Data
6	TMDS Data 1-	15	DDC Clock
7	TMDS Data 0+	14	No Connect
8	TMDS Data 0 Shield	13	CEC
9	TMDS Data 0-	12	TMDS Clock-
10	TMDS Clock+	11	TMDS Clock Shield

VGA cards

See Table 11: VGA (CM-MOD-VGI10 and CMMOD-VGO10) on page 18.

Scale all inputs to 1080p. The card is compatible with C-Video, YUV, YC (factory preset function). The bandwidth is up to 350 MHz (-3 dB). It supports RGBHV, RGsB, RGBS, RsGsBs, YUV, YC and Composite video.

CM-MOD-VGI10: This input card supports four input signals (max.). Input signal can pass to output device through any kind of output card.

CM-MOD-VGO10: This input card supports four output signals (max.). Output signal can pass to output device through any kind of output card.

The following figure shows the pin layout for the VGA connectors (female).

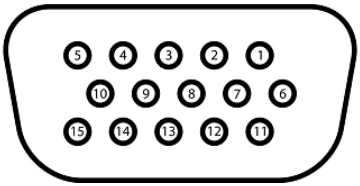


Table 5: VGA connector pin layout

Pin	Signal Name	Pin	Signal Name
1	RED	9	KEY/PWR
2	GREEN	10	GND
3	BLUE	11	ID0/RES
4	ID2/RES	12	ID1/SDA
5	GND	13	HSync
6	RED_RTN	14	VSync
7	GREEN_RTN	15	ID3/SCL
8	BLUE_RTN		

HDBaseT cards

Twisted pair card (HDMI extender). See Table 12: HDBaseT (CM-MOD-HDBI10 and CM-MOD-HDBO10) on page 19.

The card supports HDTV and is compatible with HDMI 1.4a and HDCP.

CM-MOD-HDBI10: This input card supports four HDMI TP input signals. Input signals can pass to the output device through the CM-MOD-HDBO10, or through other types of output cards. Needs to work with the CM-BT10-TX70.

CM-MOD-HDBO10: This output card support four HDMI TP output signals (max.). Output signals can come from the CM-MOD-HDBI10, or from other types of input cards. Needs to work with the CM-BT10-RX70.

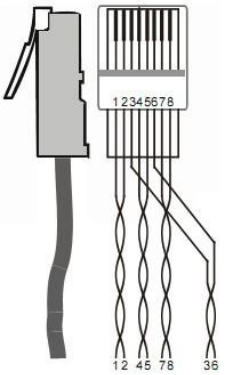
Table 6 lists the pin layouts of the RJ45 connectors. You can choose from two different connection standards. The connectors of the same cable should use the same standard.

Note: The Cat5e/Cat6 terminations for HDBaseT devices should be a straight thru TIA/EIA T568B standard. TIA/EIA T568A standard is not recommended.

Table 6: T568A and T568B cable standards

TIA/EIA T568A	
Pin	**Cable color**
1	green white
2	green
3	orange white
4	blue
5	blue white
6	orange
7	brown white
8	brown

TIA/EIA T568B	
Pin	**Cable color**
1	orange white
2	orange
3	green white
4	blue
5	blue white
6	green
7	brown white
8	brown



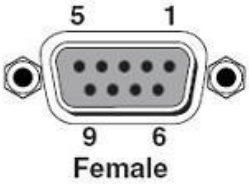
Note: Cable connectors must be metal, and the shielded layer of cable must be connected to the connector's metal shell to share the grounding.

Connecting with the RS-232 communication port

You can control the switch from the front panel, IR, or RS-232. The pin definitions are listed in the table below.

Table 7: RS-232 connection definitions

No.	Pin	Function
1	N/u	Unused
2	Tx	Transmit
3	Rx	Receive
4	N/u	Unused
5	Gnd	Ground
6	N/u	Unused
7	N/u	Unused
8	N/u	Unused
9	N/u	Unused



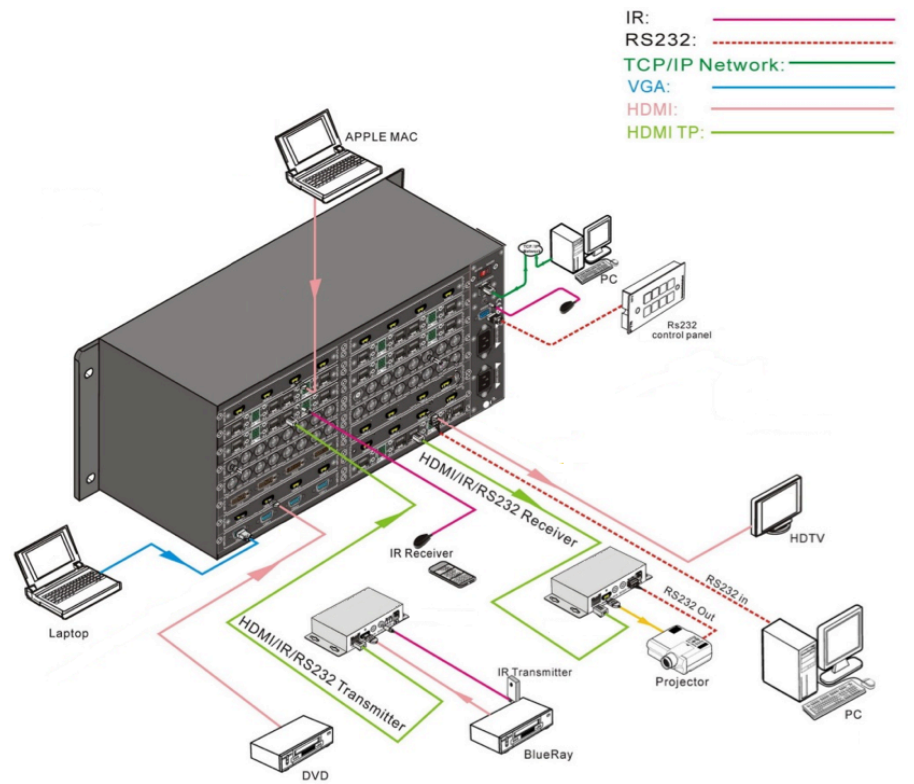
Connecting with a computer

When the MMX matrix connects to the RS-232 port of a computer with control software, users can control it by that computer. To control the switch, users need to use RS-232 control software.

System diagram

The following figure shows a typical system setup.

Figure 1: System diagram



IP and RS-232 control protocol

Use this command system to operate and control the matrix switch remotely with RS-232 software.

Communication protocol: RS-232 communication protocol

Baud rate: 9600 Data bit: 8 Stop bit: 1 Parity bit: none

Table 8: RS-232 command types and codes

Command Type	Command Code	Function
System Command	/*Type	Returns the switch model information.
	/%Lock	Lock the front panel buttons on the switch.
	/%Unlock	Unlock the front panel buttons on the switch.
	/^Version	Returns the firmware version installed.
	/:MessageOff	Turn off the feedback command from the COM port. It displays “switch OK”.
	/:MessageOn	Turn on the feedback command from the com port.
	Demo	Puts the switch into Demo mode.
	Undo	Cancels the prior command.
Operation Command	All#.	Transfer all input signals to the corresponding output channels respectively.
	All$.	Switch off all the output channels.
	[x]#.	Transfer signals from the input channel [x] to the output channel [x].
	[x]$.	Switch off the output channel [x].
	[x1] V[x2].	Transfer the video signals from the input channel [x1] to the output channel [x2].
	[x1] B[x2].	Transfer signal from the input channel [x1] to the output channel [x2].
	Status[x].	Inquire the input channel to the output channel [x].
	Status.	Inquire the input channel to the output channels one by one.
	Save[Y].	Save the present operation to the preset command [Y]. [Y] ranges from 0 to 9.
	Recall[Y].	Recall the preset command [Y].
	Clear[Y].	Clear the preset command [Y].
	PWON.	Work normally.

PWOFF.	Enter Standby mode.
All@.	Switch on all the outputs.
[x]@.	Switch on output [x].
HDCPON.	Turn on the HDCP output.
HDCPOFF.	Turn off the HDCP output.
HPDNormal	Verify the hot-plug of output channels are working normally.
HPDBypass	Ignore the hot-plug check for the output channels.
/V00.	Inquire the version of the backboard software.
/V1[x].	Inquire the software version of the input signal card [x].
/V2[x].	Inquire the software version of the output signal card [x].
EDIDUpgrade[x].	Upgrade EDID data via the RS232 port [X] is the input port. When the value of X is 5, it means to upgrade to all input ports. When the switch receives the command, it displays a message to send the EDID file (.bin file). Operations will be canceled after ten seconds.
UpgradeIntEDID[x].	Upgrade the built-in EDID data. It supports six types of EDID data. When the switch receives the command, it will show a message to send EDID file (.bin file). When X is 1 to 4, it means to upgrade the four built-in EDID data. When X is 5 or 6, it means to upgrade the saved EDID data of the DVI. Operations will be canceled after ten seconds.
EDID/[x]/[y].	Set the EDID data of input port [x] to the built-in EDID data of type [y]. The value of [y] is 1, 2, 3, and 4. The EDID data types are same as mentioned above.
EDIDG[x].	Get EDID data from the output channel X and display the data on the serial port control software. Where [x] is the output port number.
EDIDMInit.	Recover the factory default EDID data for each input channel.
EDIDM[X]B[Y].	Manual EDID switching. Enable input [Y] to learn the EDID data of output[X]. If there is problem learning the EDID data, it automatically sets the default EDID data for input [Y].

USER/[Y]/[X]:*****;	Custom command for VGA signal cards. Where: [Y] = I/O [X] = port number ***** = User-definable command (e.g., 0623%)
AUDIO[X]I[Z].	Select audio source from audio inputs or AV signal inputs. This is only available for input signal cards that provide audio source selection.

Notes

- [x] is the channel of the matrix switch, but not the channel of the card. It must be two bytes.
- [x1], [x2], [x3] and [x4] are the symbols of the input or output channels ranged according to the model of the matrix switch. If the symbols exceed the effective range, it will be interpreted as a wrong command.
- Remember to end the commands with the ending symbols “.” and “;”.
- Type the command carefully. It is case-sensitive.

Detailed examples

Example 1

Transfer signals from an input channel to all output channels: [x1]All.

e.g., “3All.” to transfer signals from the input 3 to all output channels.

Example 2

Transfer all input signals to the corresponding output channels respectively: All#.

e.g., The status of matrix switch will be: 1 > 1, 2 > 2, 3 > 3, 4 > 4…… 8 > 8.

Example 3

Switch off all the output channels: All$.

e.g., After running this command, there will be no signals on any of the outputs.

Example 4

Switch off the detail feedback command from the COM port: /:MessageOff;

e.g., It will leave the “switch OK” as the feedback, when you switch the matrix.

Example 5

Switch on the detail feedback command from the COM port: /:MessageOn;

e.g., It will show the detail switch information when it switches. When switch 1 > 2, it will feedback “AV01 to 02”.

Example 6

Transfer signals from an input channel to the corresponding output channel: [x]#.

e.g., “5#.” to transfer signals from the input5 to the output5.

Example 7

Switch off an output channel: [x]$.

e.g., “5$.” to switch off the output 5.

Example 8

Switch signal: [x1] B[x2].

e.g., “12B12,13,15.” to transfer signal from the input12 to the output No.12,13,15.

Example 8

Inquire the input channel to the output channel [x]: Status[x].

e.g., “Status23.” to inquire the input channel to the output23.

Example 10

Inquire the input channel to the output channels one by one: Status.

e.g., “Status.” to inquire the input channel to the output channels one by one.

Example 11

Save the present operation to the preset command [Y]: Save[Y].

e.g., “Save7.” to save the present operation to the preset command No.7.

Example 12

Recall the preset command [Y]: Recall[Y].

e.g., “Recall5.” to recall the preset command No.5.

Example 13

Clear the preset command [Y]: Clear[Y].

e.g., “Clear5.” to clear the preset command No.5.

Example 14

EDID management command:. EDIDM[X]B[Y].

e.g., “EDIDM5B3.” to copy the EDID data of the display on output5 to input3.

Specifications

Table 9: Main unit

Control parts			
Gain	0 dB	Bandwidth	6.75 Gbit/s
Serial control port	RS-232, 9-pin female D connector	Pin configurations	2 = TX 3 = RX 5 = GND
Installation	Rack-mountable	Front panel control	Buttons
Options	TCP/IP control by a web-based GUI		
General			
Power supplies	100 to 240 VAC, 50/60Hz	Power consumption	16x16: 84 W 32x32: 200 W
Temperature	-20° to +70°C	Humidity	10 to 90%
Case dimension (W × H × D)	16x16: 482.6 × 132.5 × 320 mm (3U high)	Product weight	16x16: 3.5 Kg
	32x32: 482.6 × 221.5 × 320 mm (5U high)	Product weight	32x32: 5 Kg

Changeable cards

Table 10: HDMI (CM-MOD-HDI10 and CM-MOD-HDO10)

Input		**Output**	
Input	4 HDMI	Input	4 HDMI
Input connector	Female HDMI	Input connector	Female HDMI
Input level	T.M.D.S. 2.9 V / 3.3 V	Input level	T.M.D.S. 2.9 V / 3.3 V
Input impedance	75Ω	Input impedance	75Ω
General			
Gain	0 dB	Gain	0 dB
Video signal	HDMI 1.4a full digital T.M.D.S signal	Video signal	HDMI 1.4a full digital T.M.D.S signal
Switching speed	200 ns (max.)	Switching speed	200 ns (max.)
EDID and DDC	Supports Extended Display Identification Data (EDID) and Display Data Channel (DDC) data using HDMI standards. EDID and DDC signals are actively buffered		
HDCP	Compliant with HDCP using HDMI 1.4a standards		

Table 11: VGA (CM-MOD-VGI10 and CMMOD-VGO10)

Input			
Input	4 VGA, (Female 15 pin HD); 0.5 to 2.0 Vp-p; 75Ω 4 stereo audio, 3P captive screw (3.81mm); >10kΩ	Output	4 VGA, (Female 15 pin HD); 0.5 to 2.0 Vp-p; 75Ω 4 Stereo audio (3.5 mm jack)
Input signal	VGA-UXGA, RGBHV, RGBS, RGsB, RsGsBs, component video, S-video and C-video, stereo audio	Output signal	RGBHV, stereo audio
Input coupling	AC coupling only	Input level	AC coupling only
Input impedance	0.5 to 2.0 Vp-p	Output impedance	75Ω
General			
Gain	0 dB	Gain	0 dB
Bandwidth	350 MHz (-3 dB)	Bandwidth	350 MHz (-3 dB)
Crosstalk	<-50 dB at 5 MHz	Crosstalk	<-50 dB at 5 MHz
Switching type	Vertical interval	Switching type	200 ns (max.)
Resolution	1920*1080p; XGA, 1024*768; 1280*720p; WXGA, 1280*800		

Table 12: HDBaseT (CM-MOD-HDBI10 and CM-MOD-HDBO10)

Video Input		**Video Output**	
Input	4 RJ45, 4IR and RS-232	Output	4 RJ45, 4IR and RS-232
Input connector	Female RJ45 3.5 mm mini jack for IR 3 poles captive screw connector for RS-232	Output connector	Female RJ45 3.5mm mini jack for IR 3 poles captive screw connector for RS-232
Input impedance	75Ω	Output impedance	75Ω
Video General			
Gain	0dB to 10dB at 100 MHz	Bandwidth	6.75 Gbps
Resolution range	800x600 to 1920x1200	Transmission distance	100 m (max.)
SNR	>70dB at 100 MHz-100 m	Return loss	<-30dB at 5KHz
THD	<0.005% at 1 KHz	Min to max. level	<0.3 V to 1.45 Vp-p
HDMI standard	Support HDMI1.4a and HDCP	Differential Phasic Error	±10° at 135 MHz 100 m

Troubleshooting and maintenance

- When there is a color loss or no video signal output, the cables may be broken or are not well connected.
- When EDID management does not work normally, the HDMI cable may be broken at the output end.
- When switching, there is a blank screen on the displayer, the displayer may not support the resolution of the video source. Switch again or manage the EDID data manually to make the resolution of the video source automatically comply with the output resolution.
- When a user cannot control the switch by computer through its COM port, check the COM port number in the software. Make sure the COM port is in good condition and the communication protocol is correct.
- When switching and there is no output image:
  - Check that there is a signal at the input and the output.
  - Check if the output port number is the same with the controlled one.
  - Check that the input/output cables are not broken, nor the connectors are loose. Try another cable.
- It is not uncommon for any switch device to experience trouble when learning 3D EDID signal from a source device, such as a Blu-ray player. If your switch cannot learn the 3D EDID signal, connect the source device directly to the display device (TV) and play the movie. Once the movie begins playing, reconnect the source device to the switch and relearn the EDID data.

Safety operation guide

To guarantee the reliable operation of the equipment and safety of the staff, please follow the procedures listed below.

- The system must be grounded properly. Do not use two blades plugs. Ensure the supply voltage is in the correct range of 100 to 240 V and from 50 to 60 Hz.
- Do not locate the device in a place that is abnormally hot or cold or does not have proper temperature control and ventilation.
- The device generates heat when running. Its environment should be well ventilated to prevent damage caused by overheating.
- Disconnect power in humid weather, or when left unused for long periods.
- Before making or removing any connections to the device, ensure that the power supplies have been disconnected.
- Do not attempt to open the enclosure of the equipment. Do not attempt any repairs. There are no user-serviceable parts inside. Any attempt to open the equipment will result in a complete void of any warranty and may result in serious injury or death.
- Do not splash any chemical substances or liquids on or around the equipment.

After-sales service

- If there appears to be problems when running the device, refer to the “Troubleshooting and maintenance” section in this manual. Return shipping costs are not covered by this warranty.
- You can contact Customer Support at http://support.clarecontrols.com. Please be ready to provide the following information.
    - Product model number, version and serial number.
    - Detailed description of the trouble issues.
    - Description of all connections and third-party equipment being used.
- We offer this product with a three-year warranty, which starts from the first day you purchase this product.
- If, during the warranty period, the unit cannot be repaired, a suitable replacement will be issued. Replacement units will be comparable to the original. However, due to potential design changes over time, replacement units may not be identical to the unit replaced.
- Items not covered by this warranty.
    - Damage caused due to incorrect usage and/or connections.
    - Damage caused due to installation by person(s) not adequately trained in the installation of this equipment.
    - Any attempt to open this unit and access internal components shall immediately void this warranty.
    - Damage caused by any physical force (dropping the unit or dropping an object upon the unit, etc.).
    - Damage caused by voltage/cycle fluctuations outside acceptable range.
    - Damage caused by over-current, voltage spikes or lightning damage due to inadequate surge protection.
- A valid invoice of purchase via an authorized dealer shall be required for any warranty coverage.